



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

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MATERIALS AND TEST UNIT

September 9, 2003

MEMORANDUM TO: Division Engineers

FROM: CECIL L. JONES, P.E.
State Materials Engineer

SUBJECT: Making, Curing and Transporting Concrete
Test Specimens

The acceptance of most concrete used on projects is based upon the results of compression testing of field prepared test specimens. Since July of 1992, technicians testing fresh concrete and making the compression cylinders for strength testing have been required to possess a valid concrete field technician certificate. It is critical that the concrete is sampled and the cylinders prepared and cured as prescribed in AASHTO T 23 in order to obtain accurate test results. Considering the value of the concrete work being performed, we need to be sure that the concrete being placed meets our specification requirements. Unfortunately, test specimens that arrive at our testing laboratories in a condition other than what is specified in AASHTO -23 cannot be properly tested for compressive strength. When this occurs, they are marked as failing and an investigation of the concrete member they represent must be performed to determine its acceptability. This results in an investment of additional time and money and does not provide as reliable an estimate of strength as the cylinder specimens.

In an effort to improve the quality of test specimens, several initiatives have been implemented. First, an emphasis on the importance of sampling, specimen preparation and curing has been added to the Concrete Certification Courses. Secondly, we have purchased cylinder crates for transporting the test specimens to the laboratory. Additionally, the department has adopted a new policy for the making, curing and transportation of concrete compressive strength test specimens.

Attached to this memorandum are the recommended procedures for use of the 4"x 8" plastic cylinder molds and the department's policy regarding improperly made specimens.

Please share this information with appropriate personnel in your Division.

cc: Roberto Canales, PE
S. D. DeWitt, PE
Lin Wiggins, PE
Lacy Love, PE
Resident Engineers
District Engineers
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bcc: Jack Cowsert, PE
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PROCEDURES FOR MAKING, CURING AND TRANSPORTING CONCRETE TEST SPECIMENS

1. Preparing the 4" x 8" plastic molds for reuse.

1. Drill a small hole, approximately 1/8 inch in diameter, in the bottom of mold.
2. Seal the hole on the inside of the cylinder mold with tape to make the cylinder mold water-tight.
3. Apply a light coat of lubricant (form oil, CRC, etc.) to the mold interior. This aids in separation of the mold from the concrete cylinder and helps prevent damage to the interior surface. Make sure there is no standing oil in the mold before placing any concrete in it.

11. Casting the 4" x 8" cylinders.

Note: A person who is currently certified by the Materials and Tests Unit as a Field Concrete Technician must make all concrete test cylinders.

1. Select and prepare a proper site for preparing the molds and making the test specimens. This location should be as close as possible to where the member is cast but far enough away to protect them from construction activities, vibrations or other disturbances.
2. Select a representative sample of concrete and remix it before making the cylinders. (See Concrete Field Technician Study Guide) For 4" x 8" cylinders only 2 layers are required. The tamping rod shall be a 3/8 inch diameter straight steel rod having a hemispherical tip. Fill the cylinder with two layers, rodding each layer 25 times.
3. After casting the cylinders, seal them with opaque plastic caps. The initial storage of all cylinders should be in some type of curing box. Large coolers work well. Ensure that the curing box and cylinders are level.
4. Protect the cylinders from vibration and other disturbances for the first 24 hours. Keep them in a moist condition at temperatures between 60° and 80° F. Moisture can be maintained by simply putting a 1/4 inch of water in the bottom of the cooler.

III. Curing- Cure the cylinders until they are delivered to the laboratory. One or more of the following procedures can control a satisfactory temperature environment during the initial curing of the specimens: Use of ventilation, use of ice, use of thermostatically controlled heating or cooling devices, use of heating methods such as stoves or light bulbs.

IV. Transporting test cylinders to the laboratory.

Recommended procedure: Transport cylinders to the laboratory in the 4" x 8" plastic reusable molds.

- a. Deliver the cylinders to the laboratory no later than 7 days after casting.
- b. Do not allow the cylinders to roll or fall while transporting them to the laboratory. The department has cylinder crates available that can store a maximum of 8 cylinders at one time. Coolers are available that will accommodate the crates. These crates are available through you local Section Concrete technician.
- c. Identify each cylinder by contract number, sample number, and date made.

V Removal of Cylinders from the 4" x 8" reusable molds at the laboratory by the Construction Technician.

Remove the cylinders at the laboratory with compressed air. Cylinders must be at least 24 hours old prior to removing them from the mold.

Procedure:

- a. Remove the cap, turn the cylinder upside down, and apply air pressure to the hole in the bottom of the cylinder mold. The mold should then rise on the cylinder. If the cylinder cannot be removed from the mold with compressed air, carefully split one side of the mold with the tool provided at the laboratory.
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- b. Use a permanent marker to transfer the identification information to the cylinder. This is provided at the laboratory.
- c. Laboratory personnel are not responsible for removing molds or marking cylinders.

VI. Reuse of the 4"x 8" plastic molds.

- a. Inspect the 4" x 8" plastic molds before and after each use.
- b. Check the plastic mold for warping, splitting, and pitting.
- c. Discard the mold if it is deformed to the extent that it will not produce an acceptable cylinder.

Policy on Improperly Made, Stored, Handled or Transported Concrete Cylinders

1. Concrete cylinder specimens that do not conform to requirements of AASHTO T 23 will be marked as failing the compressive strength requirements.
2. An investigation will be conducted by the local Concrete technician to determine the cause of the deficiency and the acceptability of the concrete member it represents.
3. A review will also be initiated to determine if follow up training or other measures, are needed in order to achieve compliance with specification requirements. Repeated failure to follow these requirements may result in the revocation of the Concrete Field Technician Certification.

While it is not the intent of the Materials and tests Unit to revoke certifications, we are responsible to assure that accurate data is used to make decisions relative to the acceptability of concrete. The methods for making, storage, handling and transporting of cylinders should follow the guidelines stated in AASHTO T 23, a copy of which can be obtained from the local Materials and Tests Concrete Technicians.